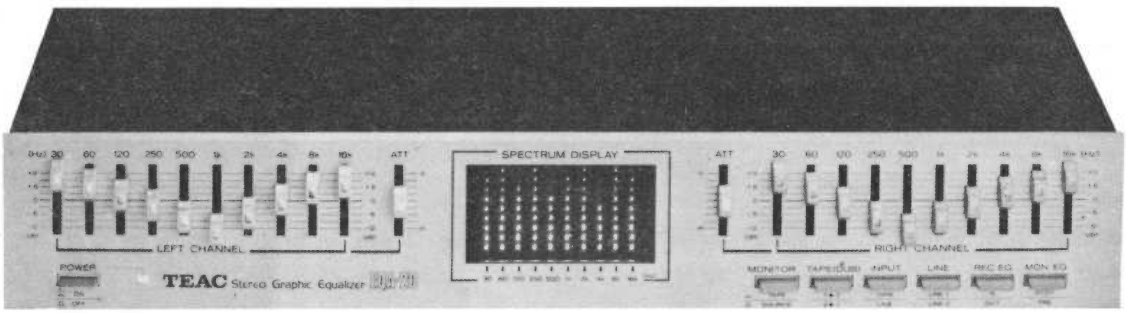
636

# TEAC®

# EQA-20 GRAPHIC EQUALIZER




## OWNER'S/SERVICE MANUAL

SM0002118

## CONTENTS


Introduction ..... 2
Physical Dimensions ..... 2
Features and Controls ..... 2
Block Diagram ..... 4
Hookup Connections ..... 4
Octave Analyzer ..... 6
Adjusting Effectively ..... 6
Musical Frequency Chart ..... 6
Specifications ..... 7
Servicing Information ..... 8
Parts List ..... 8-9
Circuit Schematic and PCB Layout ..... 10-11


WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS DEVICE TO RAIN OR MOISTURE.

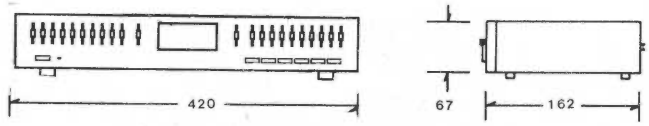
YOUR EQA-20 HAS A SERIAL NUMBER LOCATED ON THE REAR PANEL. PLEASE NOTE THE SERIAL NUMBER HERE IN THE MANUAL AND STORE BOTH WITH YOUR IMPORTANT DOCUMENTS.
SERIAL NUMBER_____

TEAC continually engages in a program of study and improvement of its products and reserves the right to change features and specifications without notice.

### INTRODUCTION:

The TEAC Model EQA-20 is a stereo ten band graphic equalizer with a ten band audio frequency spectrum display incorporated into the front panel between the two sets of equalizer boost/cut controls. The display gives a visual graph of the levels of each frequency band as the audio signals are passing through the circuit ("real time"). The EQA-20 also has front panel switches that allow it to be used in many different ways, making it a very flexible way to tailor your sound.

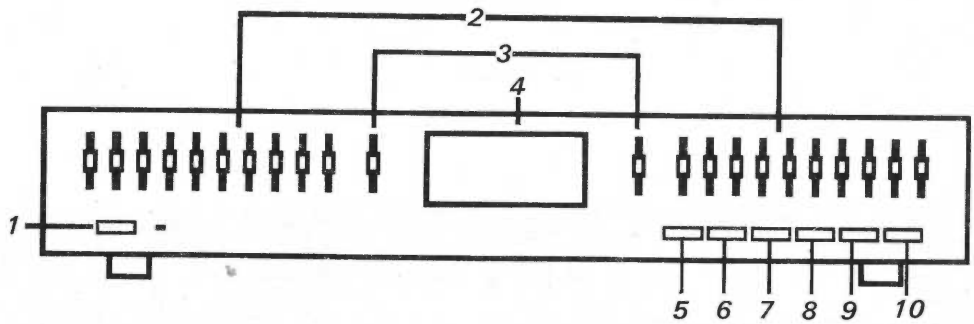
### EQA-20 DIMENSIONS (mm)




### FEATURES:

* Stereo ten band boost & cut ± 12 dB at 30 Hz., 60Hz., 120Hz., 250Hz., 500Hz., 1 KHz., 2KHz., 4kHz., 8kHz., & 16kHz.
* Separate set of controls for Left and Right.
* Lighted boost/cut controls.
* Right and Left channel attenuators
* Large audio spectrum LED display.
* Two Line Inputs.
* Two Tape Inputs.
* Input selector switch to select Line or Tape Inputs
* Tape Dubbing capability – Tape 1 to Tape 2, or Tape 2 to Tape 1.
* Flexible monitor section.
* Record EQ In/Out switch.
* Monitor EQ In/Out switch.

### CONTROLS:



(1) POWER SWITCH – When depressed (▬), the unit powers up, the LED indicator to the right of the Power Switch lights up, and the LED's in the attenuators and boost/cut controls light up. Push the Power Switch again (▬), and the EQA-20 turns off.

(2) BOOST/CUT CONTROLS – Adjustment of these controls determine the amount of boost or cut at the frequency band shown below the control. The LED's in the knobs allow you to see at a glance where the controls are set.

(3) LEFT AND RIGHT ATTENUATORS – Provide individual level control for left and right MONITOR channels, adjust overall levels, and balance the two channels to each other. The LEFT AND RIGHT ATTENUATORS have no effect on the recording; they only affect the signal going to the MONITOR OUT jacks.

(4) REAL TIME AUDIO SPECTRUM DISPLAY –

This displays the energy present in each frequency bands of both Left and Right Channels combined as the audio signals pass through the circuitry ("real time"). The frequency bands of the display correspond to the frequency bands of the Boost/Cut controls. Each vertical LED represents a ± 12 dB change in level for that frequency band.

(5) MONITOR SWITCH – This selects the audio signal being sent to the Monitor Out jacks on the back panel. With this switch in the 'TAPE" position (▬), the Tape Input selected by the Tape (DUB) switch is routed to the monitor out jacks, and at the "SOURCE" (▬) position the input selected by the Input switch (7) is routed to the Monitor Out jacks, with or without equalization, depending on whether "MONITOR EQ" switch (10) is in pre or post position.

If you are recording on a three head machine, the MONITOR switch allows you to monitor the tape machine from its playback head. This way you can hear exactly what has been recorded on the tape without having to stop, rewind, and then playback the tape. Set the tape machine's monitor switch to "TAPE", set the EQA-20's MONITOR switch to "TAPE" and set the "TAPE (DUB)" switch to TAPE 1 or 2, whichever you are recording to.

(6) TAPE (DUB) SWITCH – This switch performs two jobs. It determines whether Tape 1 dubs to Tape 2 or Tape 2 dubs to Tape 1, and it also selects Tape 1 input or Tape 2 input when the Input switch is in "Tape" (▬) position. At the in (▬) position (Tape 1 〉 Tape 2), you can dub from Tape Machine 1 to Tape Machine 2, and Tape 1 input has been selected. In the out (▬) position (Tape 2 〉 Tape 1) you can dub from Tape Machine 2 to Tape Machine 1, and Tape 2 input has been selected. To playback a previously recorded tape, select the appropriate machine with this switch, set the Monitor switch to Tape, and play the tape through the Monitor Out jacks.

(7) INPUT SWITCH — This determines whether the Tape Inputs or Line Inputs are fed to the equalizer circuits. At the in (▬) position ("Tape"), the Tape Input selected with the Tape(DUB)switch is fed to the equalizer circuit. In the out (▬) position ("Line"), the Line Input selected with the Line switch is fed to the equalizer circuit. In this position the Input switch also connects Tape Out 1 to Tape Out 2 so that you can record on Tape Machine 1 and Tape Machine 2 at the same time with the same signal.

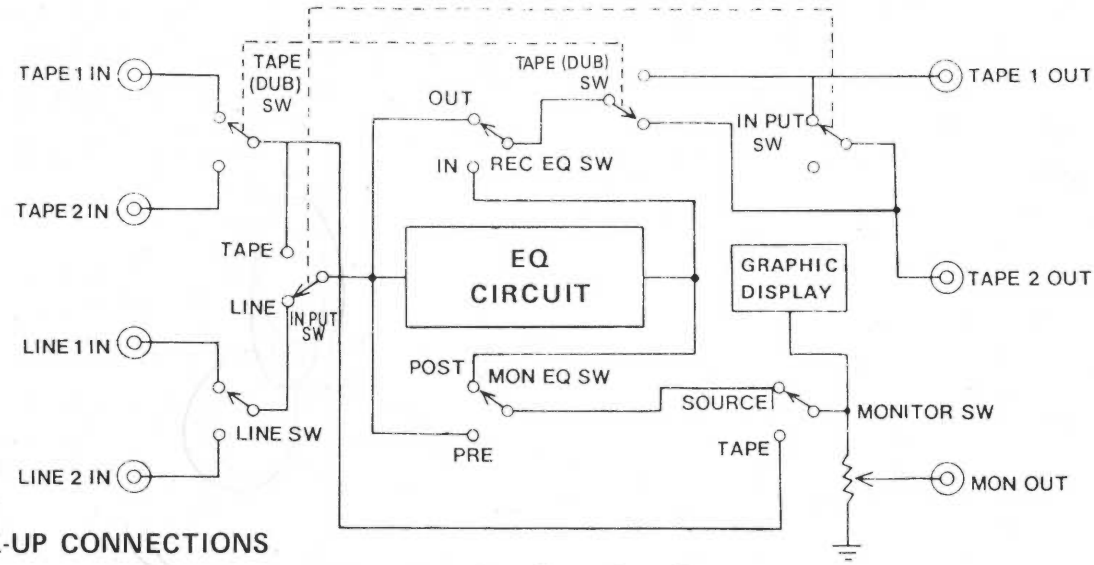
(8) LINE SWITCH – This selects between Line In 1 and Line In 2. These inputs can be used to receive audio signals from such sources as a stereo receiver, a reel-to-reel tape deck, or

other such units. At the in (▬) position Line In 1 has been selected, and at the out (▮) position Line In 2 has been selected.

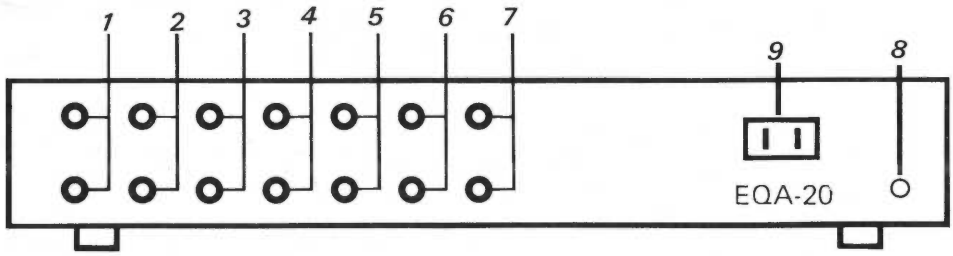
(9) RECORD EQ SWITCH – This switches the equalizer in and out of the audio path going to the Tape Outs for recording. At the in (▬) position the equalizer affects the signal, and at the out (▮) position the equalizer does not affect the signal. This switch does not affect the signal going to the Monitor Out for listening.

(10) MONITOR EQ SWITCH – This switches the equalizer in and out of the signal path going to the Monitor Out jacks on the back panel when the Monitor switch (# 5) is on "Source" (▮). At the "POST" position (▬), the equalizer affects the signal being fed to the Monitor Out jacks, and in the "PRE" position (▮), the equalizer is bypassed and does not affect the Monitor signal. This switch affects only the Monitor signal and operates completely independent of audio signals going to the Tape Outs.

## EQA-20 BLOCK DIAGRAM ONE CHANNEL




## HOOK-UP CONNECTIONS




(1) LINE 1 INPUT JACKS – Connect to the output of one audio source, such as a stereo receiver or preamp.

(2) LINE 2 INPUT JACKS – Connect to the output of another audio source, such as a reel-to-reel tape machine.

(3) TAPE 1 OUTPUT JACKS – Connect to the input of the first tape machine.

(4) TAPE 2 OUTPUT JACKS – Connect to the input of the second tape machine.

(5) TAPE 1 INPUT JACKS – Connect to the output of the first tape machine.

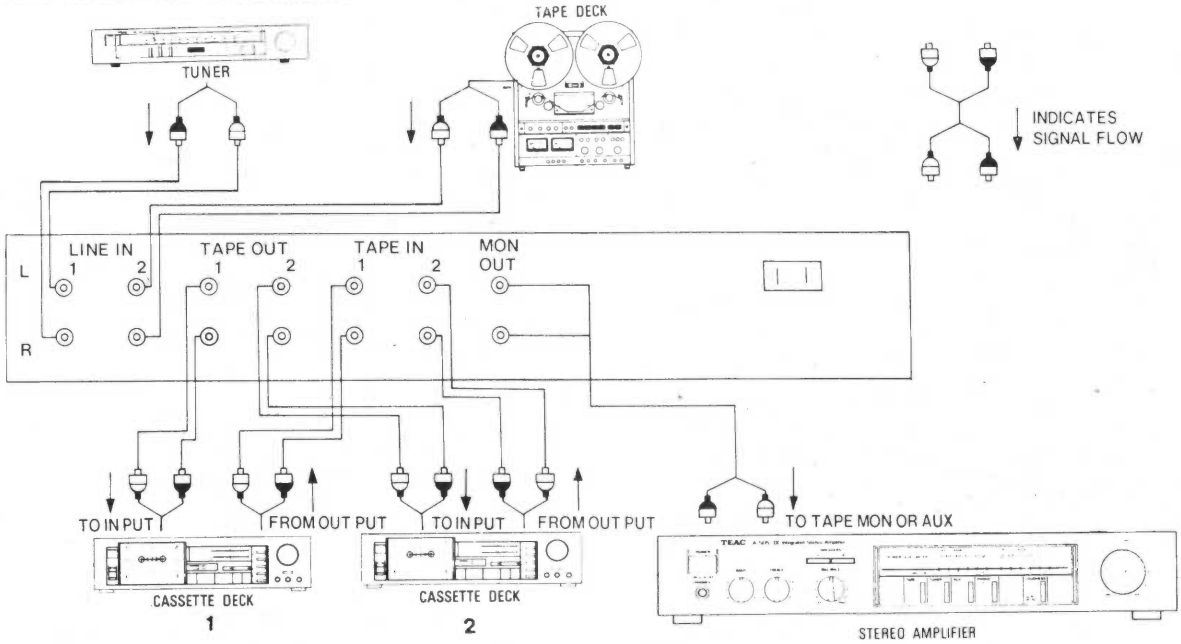
(6) TAPE 2 INPUT JACKS – Connect to the output of the second tape machine.

(7) MONITOR OUT JACKS – These connect to an input on the stereo system such as the TAPE PLAY or AUXILARY input, so that you can listen to recordings in progress or playback previously recorded tapes.

(8) POWER CORD – Plug into the wall outlet .

(9) ACCESSORY AC OUTLET – This unswitched AC outlet replaces the outlet used by the EQA-20 itself, thus providing power to another piece of equipment such as a tape recorder or receiver. Note that the rating of this convenience outlet is 250 watts.

## ABOUT THE HOOK-UP DIAGRAM




The typical hook-up shows one of the many ways in which you can use the EQA-20. Line 1 In is shown connected to a stereo tuner, and Line 2 In is shown connected to a reel-to-reel tape recorder. The two cassette recorders are also shown, the input of Cassette Deck 1 is connected to Tape 1 Out and its output is connected to Tape 1 In. Likewise, the input of Cassette Deck 2 is connected to Tape 2 Out, and its output is connected to Tape 2 In.

This hook-up allows a very flexible recording arrangement. By setting the input switch to "Line" and the Line switch to "Line 1", you can record from the stereo tuner onto Cassette Deck 1 or Cassette Deck 2 or both simultaneously. By pushing the Line switch to "Line 2", you can record from the reel-to-reel tape recorder to Cassette Deck 1 or Cassette Deck 2 or both simultaneously. To hear what is being recorded set the Monitor switch to "source" and the signal then goes from the Monitor Out jacks of the EQA-20 to Tape Monitor or AUX input on your stereo amplifier.

Successively pushing the Monitor EQ switch will allow you to hear the signal with and without the equalization, without affecting the signals going to the two cassette decks.

To record from Cassette Deck 1 to Cassette Deck 2, set the Input switch to "Tape" and the Tape (Dub) switch to "Tape 1 > Tape 2".

Pushing the Record EQ switch allows recording with or without the equalization.

To playback the tape just recorded, set the Input switch to "Tape" and select the Cassette Deck you want to playback with the Tape switch; in (▬) for Tape 1 and out (▟) for Tape 2. To Record from Cassette Deck 2 to Cassette Deck 1, set the Input switch to "Tape" and the Tape (Dub) switch to "Tape 2 > Tape 1".

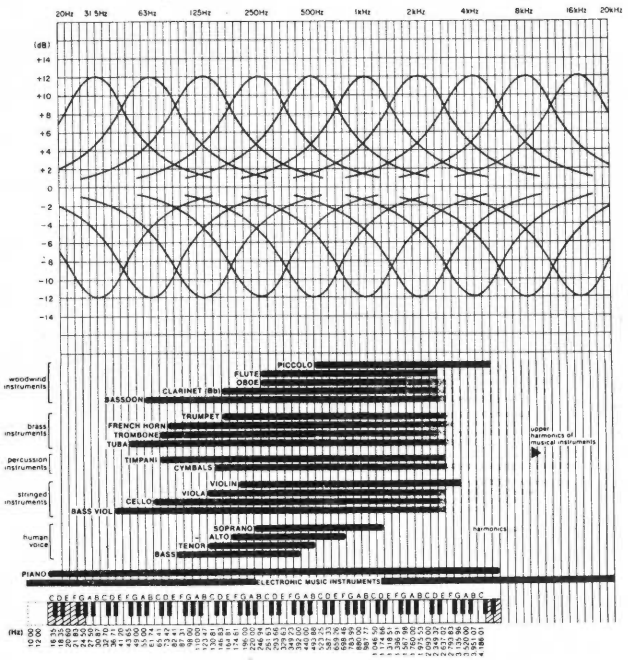
If you are recording on a three head deck from the Line In jacks, the Monitor switch allows you to monitor the tape deck from its playback head. This way you can hear exactly what has been recorded on the tape without having to stop, rewind, and THEN playback the tape. Set the three head deck's Monitor switch to TAPE, set

the EQA-20's Monitor switch to "Tape", set the Input switch to Line, and set the Tape (Dub) switch to select the tape deck you are recording on; in (▬) for Tape 1, and out (■) for Tape 2 If you want to hear the material without the equalization, while it is being recorded, simply press the Monitor switch to Source and the MON EQ switch to PRE.

All switches affect both Left and Right channels simultaneously.

The EQA-20 is a very flexible device whose capabilities extend far beyond equalization alone. It allows you to set up a sophisticated tape recording center that can handle and equalize signals from many sources, and route them in any combination desired.

## ABOUT THE SPECTRUM DISPLAY:




The spectrum display gives a visual graph of each frequency band as the audio signals are passing through the circuit ("real time"). The display may be used to read the amount of energy contained in certain musical passages for comparison, or to check the frequency spectrum of signals being fed through the EQA-20. Such signals may come from test records, test tapes, pink noise sources, or other sources.

When viewing the spectrum display, bear in mind that the right and left channels of the EQA-20 are combined when they enter the spectrum display. This combining of left and right does not occur anywhere else in the EQA-20, nor does it affect any of the signal being processed. If you wish to display only one channel, you must unplug the other channel while making the reading.

As the chart on this pate shows, the EQ bands covered by the EQA-20 are bell-shaped. They do not treat all frequencies equally about the center frequency. This is also true of the spectrum display. The filter circuits in the display that separate the audio spectrum into octaves have a similar bell-shaped response. This limits the accuracy of the spectrum display for use as a measurement tool. Careful listening in conjunction with the display, however, will help in adjusting the system for optimum performance. The final result of the use of outboard devices like equalizers is always, hopefully, better sound reproduction. Since so much of what makes things sound better is subjective, it is wise not to overlook the time-tested method of adjusting for the best sound — your ear.

The chart shows the range and frequency limits of the EQA-20 compared to the frequencies of various musical sound sources. Since music is made up of complex mixtures of energy, frequency, and time, it is usually not possible to accurately predict what the optimum reading on the spectrum display will be. There is, however, a sound called "pink noise" which has properties that make it ideal as a reference for the display settings. Pink noise has an equal amount of energy for each frequency in each octave band. (An octave band goes from a given frequency to

either half or twice that frequency, and is named by the frequency in the center of the band.) Some of the various test records available contain segments of pink noise. These segments can be played through the EQA-20 and EQ settings made to light the display for each of the octaves to the same level.

The same pink noise can be put through a cassette deck and used with the EQA-20's spectrum display to help set up the flattest frequency response. If the deck has three heads, adjustment can be done in real time by monitoring off tape while the deck is recording. If the deck has only two heads, you must record a section of tape while making the adjustment, then play that section back through the EQA-20 to see the results of your adjustments.

With the spectrum display encompassing octaves, it is not possible to see aberrations of frequency response that are narrow; perhaps a few Hertz (cycles per second) wide. It is therefore important to remember that gradual adjustments are best in almost every case, as narrow aberrations may change the display reading, while affecting the actual frequency response very little. Also, the level of energy around a dip or peak will affect how much of the dip or peak will show up on the display.

The equalization capability of the EQA-20 may be augmented by the bass and treble controls on your receiver or preamp for greater flexibility. The spectrum display will serve to keep track of the extent of equalization. Sometimes optimum frequency response cannot be acheived without help from more than one equalizer. In the case of record rumble, for example, random low frequencies are generated in the turntable. These frequencies can show up as non-musical readings in the 30 Hz. or 60 Hz. bands. For record rumble, the best solution is the subsonic filter on the preamp. Since most record rumble is between 5 Hz. and 25 Hz., the subsonic filter will fix the problem with little or no effect on the musical material.

The purpose of an equalizer is to optimize the material being processed for the best sound. The spectrum display is a tool to help attain that purpose. Since these tools have their limitations, and they cannot take into account such things as speaker placement in the room, it is important to remember that the ultimate adjustment should be done by ear.

Be careful when adding highs to signals being recorded, as it is possible to saturate the tape or overload the input with boosted highs. This will cause the sound to become distorted. Cassette machines are particularly vulnerable to this, and if the cassette machine is a two-head model, you will not be able to hear the distortion until after the recording has been made and the tape is played back.

## SPECIFICATIONS

| | | |
|---|---|---|
| Number of Channels | : | 2 |
| Number of Bands | : | 10 |
| Center Frequencies | : | 30, 60, 120, 250, 500, 1K, 2K, 4K, 8K, 16kHz |
| Center Frequency Shift | : | ± 3% |
| Boost/Cut Range | : | 12 dB ± 2 dB |
| Input Level | : | −10 dBV |
| Output Level | : | −10 dBV |
| Input Impedance | : | 56K ohms |
| Output Impedance | : | 600 ohms |
| Load Impedance | : | 10K ohms or more |
| Frequency Response | : | 20Hz – 100 kHz ± 1 dB |
| THD | : | 0.01 at 1 V Output/1 kHz |
| S/N Ratio | : | 90 dB (or better) weighted |
| Unit Gain | : | 0 dB ± 1 dB |
| Tape Dubbing Switch | : | 1 to 2, 2 to 1 |
| Input | : | Tape 1 and 2, Line 1 and 2 |
| REC EQ Switch | : | In/Out |
| MON EQ Switch | : | Pre/Post |
| LED with Slide Knobs | : | 22 |
| Power Requirements | : | 120V 50/60 Hz |
| Standard Accessory | : | Input/Output RCA Cord x 2 |

## SERVICING INFORMATION

Servicing should be done by qualified personnel. There are no user serviceable parts inside.

## TEST EQUIPMENT REQUIRED:

Audio Oscillator
Audio Voltmeter
Oscilloscope
Harmonic Distortion Analyzer

1) Set frequency controls at their "flat" setting. Check for unity gain ± 1dB from 20 to 20k Hz.

2) Sweep audio oscillator to check analyzer. Bands should appear to "bounce" across the display as the frequency is swept. Each display segment should indicate approximately 3 dB in level, vertically.

3) Set oscillator frequency for the peak reading corresponding to each frequency of the EQA-20, checking to see that the boost and cut range of each band adjusted INDIVIDUALLY, is 12dB ± 2dB.

4) Referring to the Block Diagram on page 4, check all switching paths to be sure signals pass properly.

5) Measure harmonic distortion with all settings at flat (centered) with a signal of 1KHz at nominal operating level. Measurement should be 0.05% or less.

6) Measure signal/noise using 1 volt for reference. With inputs shorted, it should measure −80dBV (0.1mV) or less.

7) Apply 1KHz, 500mV signal to Line 1 In and adjust VR 1 (VR 2) to get 500mV on Tape Out 1. (The Input switch should be "Line", the Line switch should be "Line 1" and the REC EQ switch should be "IN" position.)

PARTS NO.

**DIODES**

| | | |
|---|---|---|
| D4 | ~ 7 | IN4002 |
| D101 | ~ 110 | IN 4148 |

**ZENER DIODE**

| | | |
|---|---|---|
| D1 | ~ 3 | 12V 0.5W |

**INTEGRATED CIRCUIT**

| | | |
|---|---|---|
| IC1 | ~ 13 | BA 4558 |
| IC101 | ~ 103 | CD 4066 |
| IC104 | | CD 4017 |
| IC105 | ~ 107 | LM 324 |
| IC108 | ~ 109 | BA 6124 |

**TRANSISTOR**

| | | |
|---|---|---|
| TR1 | | 2SB564C |
| TR2 | | 2SD471C |
| TR3 | | 2SC1383 |
| TR101 | ~ 110 | 2 SC 1815 (1740) |

**CARBON RESISTOR**

| | | |
|---|---|---|
| R1 | ~ 3 | 1kΩ |
| R4 | | 820Ω |
| R5 | ~ 24 | 100k |
| R25 | ~ 44 | 390Ω |
| R45 | ~ 49 | 4.7k |
| R50 | | 1kΩ |
| R51 | ~ 52 | 56k |
| R53 | | 1kΩ |
| R54 | | 4.7k |
| R55 | | 10k |
| R56 | ~ 59 | 4.7K |
| R60 | ~ 61 | 220k |
| R62 | | 10k |
| R63 | ~ 64 | 1kΩ |
| R70 | ~ 71 | 1.5kΩ |
| R101 | ~ 110 | 10k |
| R111 | ~ 120 | 180Ω |
| R121 | ~ 130 | 820k |
| R132 | | 10k |
| R133 | ~ 136 | 22k |
| R137 | ~ 146 | 82k |
| R147 | | 4.7k |
| R148 | | 270Ω |
| R149 | | 8.2k |
| R150 | ~ 159 | 3.9K |
| R160 | ~ 161 | 470Ω |
| R162 | | 180Ω |
| R163 | ~ 164 | 330k |
| R165 | | 2.2k |
| R166 | | 100k |
| R171 | ~ 172 | 820k |
| R303 | ~ 304 | 1.8kΩ |
| R305 | ~ 308 | 560Ω |

**MYLAR CAPACITOR**

| | |
|---|---|
| MC1 ~ 2 | 0.001μF/50V |
| MC3 | 0.015μF/50V |
| MC4 | 0.033μF/50V |
| MC5 | 0.068μF/50V |
| MC6 | 0.15μF/50V |
| MC7 | 0.015μF/50V |
| MC8 | 0.033μF/50V |
| MC9 | 0.068μF/50V |
| MC10 | 0.15μF/50V |
| MC11 | 0.001μF/50V |
| MC12 | 0.0033μF/50V |
| MC13 | 0.0047μF/50V |
| MC14 | 0.01μF/50V |
| MC15 | 0.02μF/50V |
| MC16 | 0.03μF/50V |
| MC17 | 0.082μF/50V |
| MC18 | 0.001μF/50V |
| MC19 | 0.0033μF/50V |
| MC20 | 0.0047μF/50V |
| MC21 | 0.01μF/50V |
| MC22 | 0.02μF/50V |
| MC23 | 0.03μF/50V |
| MC24 | 0.082μF/50V |
| MC25 | 0.047μF/50V |
| MC26 ~ 27 | 0.001μF/50V |
| MC105 ~ 106 | 0.0015μF/50V |
| MC107 ~ 108 | 0.0056μF/50V |
| MC109 ~ 110 | 0.047μF/50V |
| MC111 ~ 112 | 0.0027μF/50V |
| MC113 | 0.0022μF/50V |
| MC116 ~ 117 | 0.012μF/50V |
| MC118 ~ 119 | 0.1μF/50V |
| MC120 ~ 121 | 0.022μF/50V |
| MC401 | 0.1μf/400V (117V USE) |
| | 0.047μf/630V(220~240V USE) |

**CERAMIC CAPACITOR**

| | |
|---|---|
| CC3 | 150PF |
| CC4 | 270PF |
| CC5 | 560PF |
| CC6 | 150PF |
| CC7 | 270PF |
| CC8 | 560PF |
| CC11 ~ 12 | 82PF |
| CC22 ~ 23 | 33PF |
| CC101 ~ 102 | 680PF |
| CC103 ~ 104 | 180PF |
| CC114 ~ 115 | 330PF |

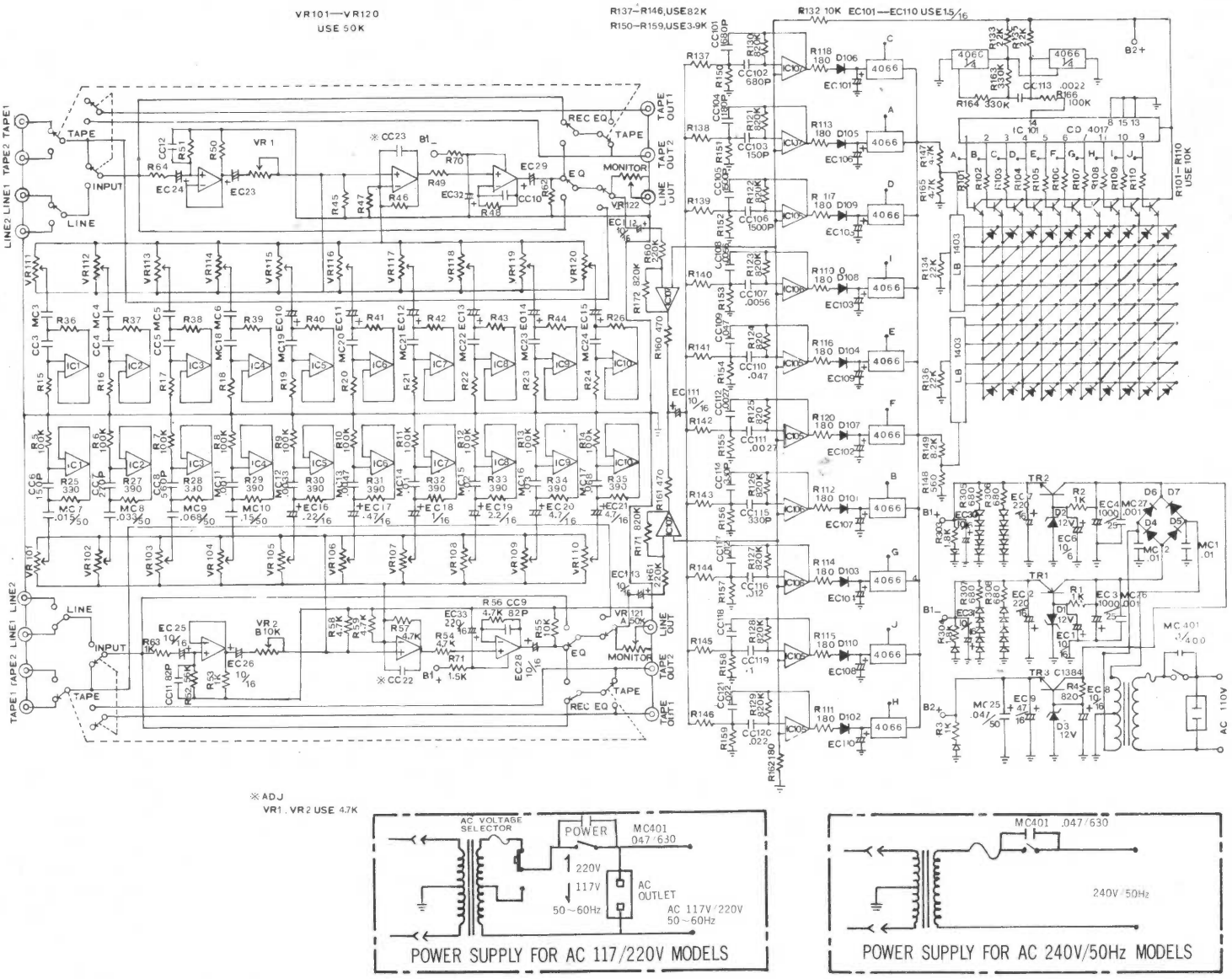
**ELECTRICRL CAPACITOR**

| | |
|---|---|
| EC1 | 100μF/16V |
| EC2 | 220μF/16V |
| EC3 ~ 4 | 1000μF/25V |
| EC6 | 100μF/16V |
| EC7 | 220μF/16V |
| EC8 | 10μF/16 |
| EC9 | 47μF/16 |
| EC10 | 0.22μF/16V |
| EC11 | 0.47μF/16 |
| EC12 | 1μF/16V |
| EC13 | 2.2μF/16V |
| EC14 | 4.7μF/16V |
| EC15 | 6.8μF/16V |
| EC16 | 0.22μF/16V |
| EC17 | 0.47μF/16V |
| EC18 | 1μF/16V |
| EC19 | 2.2μF/16V |
| EC20 | 4.7μF/16V |
| EC21 | 6.8μF/16V |
| EC23 ~ 28 | 10μF/16V |
| EC30 ~ 31 | 10μF/16V |
| EC32 ~ 33 | 220μF/16V |
| EC101 ~ 110 | 1.5μF/16V |
| EC111 | 10μF/16V |
| EC112 ~ 113 | 10μF/16V |

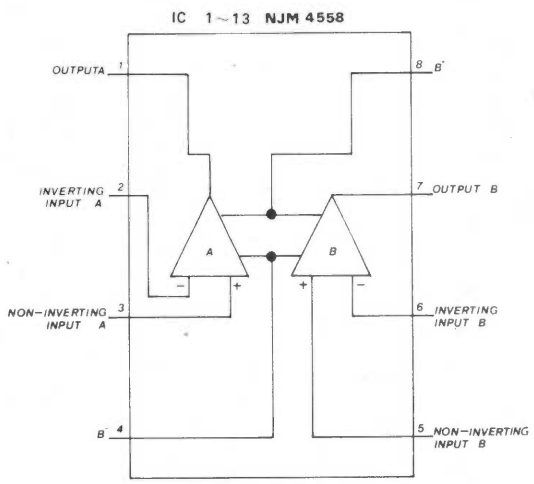
**MISCELLANEOUS**

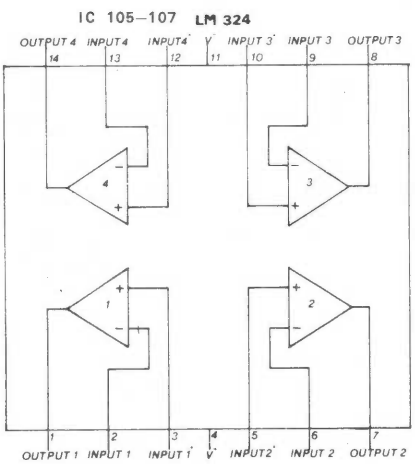
| | |
|---|---|
| TOP CABINET | SM 000 20101 |
| BOTTOM CABINET | SM 000 20102 |
| REAR PANEL | SM 000 20104 |
| FRONT PANEL ASSY' W/CLEAR PLATES | SM 000 20111 |
| SW KNOB | SM 000 20117 |
| VR KNOB | SM 000 20118 |
| ESCUTCHEON | SM 000 20119 |
| P.C. BOARD. EQ | SM 000 20201 |
| P.C. BOARD. DISPLAY | SM 000 20202 |
| P.C. BOARD. VR. L | SM 000 20203 |
| P.C. BOARD. VR. R | SM 000 20204 |
| AC JACK | SM 000 20205 |
| AC LINE | SM 000 20206 |
| PUSH SWITCH (POWER) | SM 000 20207 |
| PUSH SWITCH (FUNCTION) | SM 000 20208 |
| RCA JACK | SM 000 20209 |
| FOOT | SM 000 20211 |
| P.C.B SUPPORT | SM 000 20212 |
| L.E.D DISPLAY | SM 000 20216 |
| L.E.D (GREEN) | SM 000 20217 |
| L.E.D (RED) | SM 000 20218 |
| SLIDE VR (ATTNUATOE) | SM 000 20301 |
| SLIDE VR (BOOST/CUT) | SM 000 20302 |
| SEMIFIXED. VR. | SM 000 20303 |
| TRANSFORMER | SM 000 20317 |
| POLY BAG | SM 000 21112 |
| OUTER CARTON | SM 000 21115 |
| INNER CARTON | SM 000 21116 |
| STYRO FOAM | SM 000 21117 |
| SCRVICE MANUAL | SM 000 21118 |

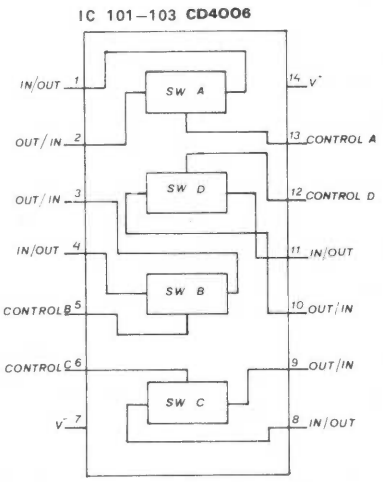
## SCHEMATIC



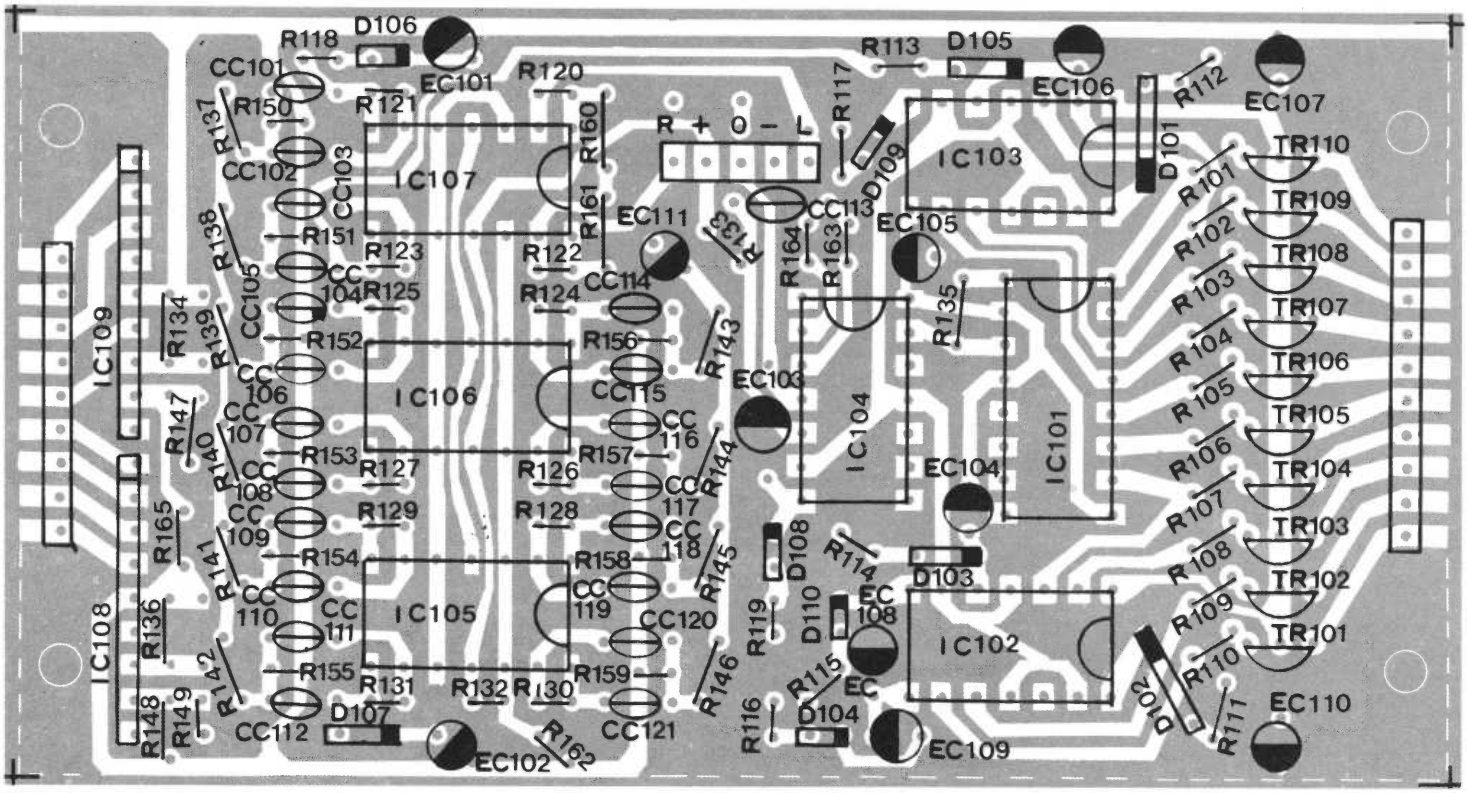

## IC CONNECTION DIAGRAMS TOP VIEWS



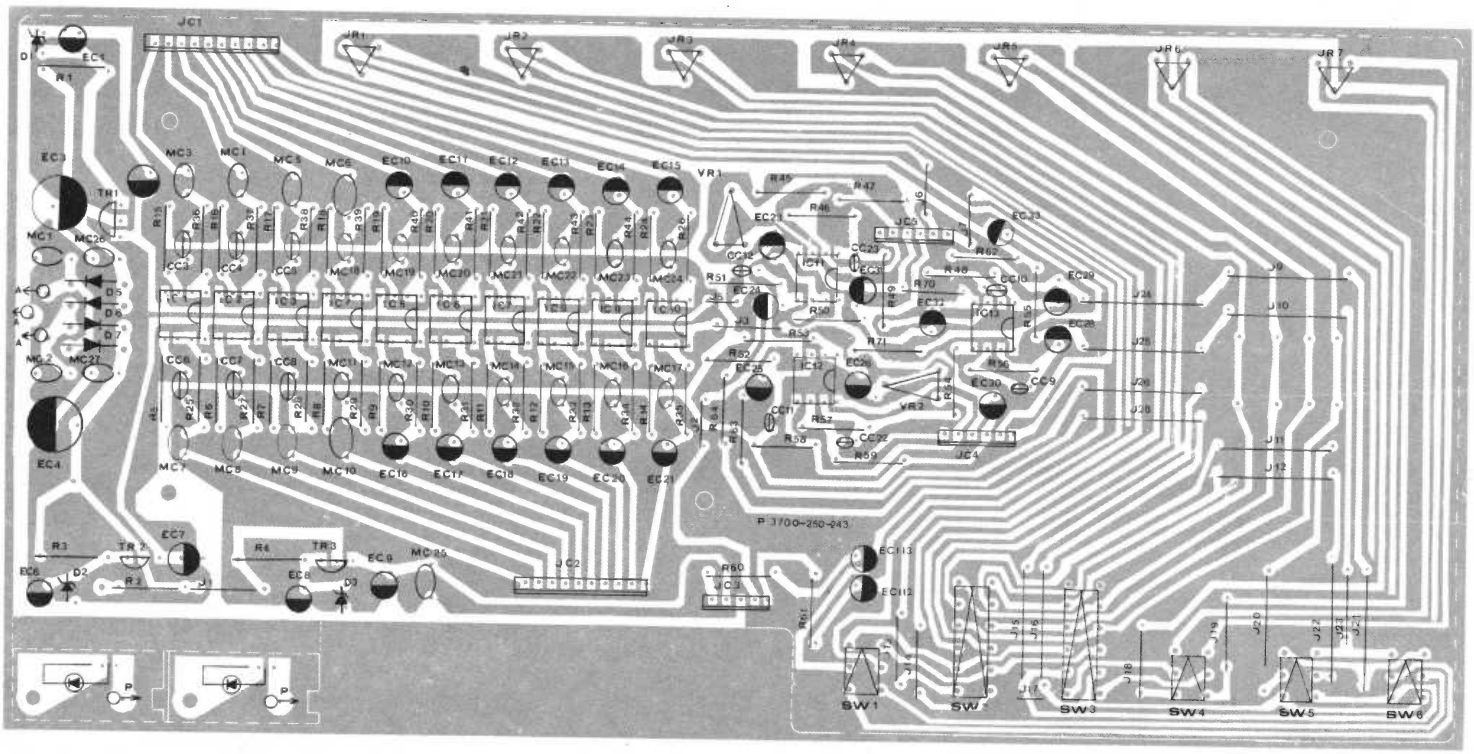



## DISPLAY PCB LAYOUT




## EQUALIZER PCB LAYOUT



# TEAC®

# EQA-20

TEAC Corporation of America
7733 Telegraph Road, Montebello, CA 90640

Printed in R.O.C.